March 2002

ARM Facilities Newsletter

ANL/ER/NL-02-03

International H_2O Project (IHOP_2002)

The International H_2O Project (IHOP_2002) will take place in west-central Oklahoma over 44 days, May 13-June 25, 2002. The main focus will be water vapor and its role in storm development and rainfall production, information needed to improve rainfall forecasting.

Forecasting the amount and location of rainfall is difficult, particularly in the warm months, and improvements are urgently needed. Accurate prediction of floods would be very beneficial to society, because flooding is costly in terms of loss of life and property damage. Deaths resulting from flash flooding outnumber those from hurricanes, tornadoes, windstorms, or lightning, and damage due to flooding exceeds $5 billion annually.

One measure of weather forecasting success is the accuracy of the Quantitative Precipitation Forecast (QPF), which predicts the amount of precipitation to be received at a certain location. One of the research goals of IHOP_2002 is to determine whether more accurate, detailed measurement of humidity will improve a computer model's ability to forecast rainfall amounts accurately.

Current water vapor measurements are inadequate. The weather balloons (radiosondes) that gather most of the water vapor data used in today's weather and global climate models have three problems. First, the radiosonde stations are located too far apart, generating a grid of data that is too coarse to show the needed details in water vapor variability. Second, the radiosonde launches occur only every 12 hours, again providing too few data points for a highly variable parameter. Third, the radiosonde instrument has biases and inaccuracies in its measurements. Questionable data quality and data sets too coarse in both time and space make accurate forecasting difficult.

The key to better, more accurate, higher-resolution water vapor measurements is dependable, ground-based sensors that operate

ARM Facilities Newsletter is published by Argonne National Laboratory, a multiprogram laboratory operated by The University of Chicago under contract W-31-109-Eng-38 with the U.S. Department of Energy.

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continually and accurately. Such sensors will decrease dependence on sparsely spaced, costly weather balloon releases. IHOP_2002 will give researchers an active platform for testing and evaluating the capabilities and limitations of several water vapor measurement instruments. For example, the National Oceanic and Atmospheric Administration (NOAA) Environmental Technology Laboratory will be bringing a mini-DIAL (differential absorption lidar) to the SGP central facility for comparison with the SGP Raman lidar. Lidars send beams of laser light skyward and measure scattered light not absorbed by water molecules.

The collection of IHOP_2002 instruments includes 2 fixed radars, 6 mobile radars, 2 airborne radars, 8 lidars (6 of which can sample water vapor), 1 advanced wind profiler, 2 sodars, 3 interferometers, 18 special surface stations, 800 radiosondes, 400 dropsondes, 1 tethersonde system, 52 global positioning system receivers, 3 profiling radiometers, 1 mobile profiling radiometer and wind profiler, and 5 water vapor radiometers.

Six research aircraft will be deployed during the course of the field campaign. The aircraft will occasionally fly low-level tracks and will deploy dropsondes. A dropsonde resembles a radiosonde, an instrument package attached to a helium-filled balloon that rises into the atmosphere, but the dropsonde is released from an airplane and collects data on its way down to the ground. Finders of dropsondes are asked to follow the instructions on the package for returning the device to the researcher.

Funding for IHOP_2002 is from many sources, including NOAA, the National Science Foundation, the National Center for Atmospheric Research, and the U.S. Department of Energy. Participation is worldwide, including researchers from Australia, Canada, France, Germany, the Netherlands, the United Kingdom, and the United States.

Figure 1. The National Aeronautics and Space Administration DC-8 (left) and Proteus (right) will be two of the six research planes collecting data during IHOP_2002 on May 13-June 25, 2002. (Photos: NASA.)